Inside NIDCD Newsletter

National Institute on Deafness and Other Communication Disorders
National Institutes of Health

www.nidcd.nih.gov

Spring 2010

Feature Story

The Long Road to Discovery: Stuttering Genes Turn Up in the Most Unexpected Places

By Robin Latham

Changsoo Kang, Ph.D., a visiting fellow in NIDCD's Laboratory of Molecular Genetics, remembers the day vividly. Sitting in an undergraduate Introduction to Biomedical Science class in South Korea, he was asked what role genes play in humans.

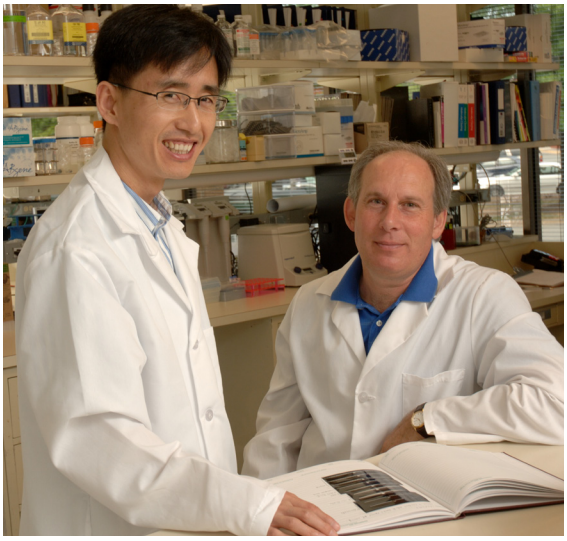
"I said that genes are involved in functions having to do with thinking and speaking, and was told that I was wrong."

More than 17 years later, Dr. Kang and an international group of researchers led by Dennis Drayna, Ph.D., have shown that genes do indeed play a role, at least in speaking, with the discovery of genes associated with stuttering. Stuttering is a communication disorder that affects more than 3 million people in America, and another 60 million worldwide. Their discovery is beginning to push back the fog of mystery that surrounds stuttering and opening up new avenues for treatment.

How this discovery was made is a tale of ingenuity, perseverance, and the ability to recognize what you're looking for in unexpected places.

The story begins in Pakistan with a cluster of families with a high incidence of stuttering. Scientists have always suspected that there is a genetic component to stuttering because it tends to run in families, but finding the right families to study, and enough of them, is challenging. It turns out that Pakistan is a very good place to study genetic diseases.

"There is a high rate of intermarriage within extended families, often cousins marrying cousins, which has been going on for centuries," says Dr. Drayna, chief of the Section on Systems Biology of Communication Disorders in the Laboratory of Molecular Genetics at NIDCD. Consequently, this narrows the gene pool and makes mutations easier to find using genetic linkage studies, which are the main tools scientists have for tracking down the locations of genes.



Changsoo Kang, Ph.D. (l), and Dennis Drayna, Ph.D.

Dr. Drayna had already done linkage studies with the Pakistani group and had turned up a promising candidate region on chromosome 12 that was likely to harbor a mutant gene, but further progress proved difficult.

There's a reason for that, says Dr. Kang, who inherited the linkage studies when he came to NIDCD to work in Dr. Drayna's lab. "Some people naturally recover from stuttering as they grow older, so it's difficult to define who's affected and who's unaffected by the mutation. Finding a gene for stuttering is hard because there's no precise genotype-phenotype match." For a scientist, this means there isn't a consistent and predictable outcome between the gene mutation and its trait or symptom. It also means that establishing the one-to-one relationship of gene to trait is much more difficult to prove.

(continued on page 2)

To add your name to **our e-mail list**, visit **http://www.nidcd.nih.gov/health/inside/**

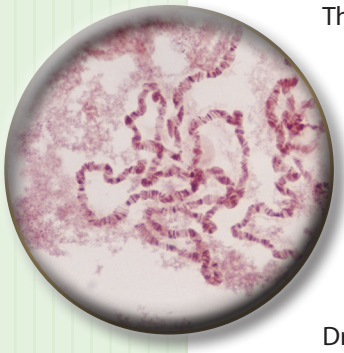
IN THIS ISSUE

Inside NIDCD Newsletter

National Institute on Deafness and Other Communication Disorders
National Institutes of Health

www.nidcd.nih.gov

Spring 2010



"My instructor said that genes had nothing to do with speech. But it turned out that they did, and I discovered one of them. It's an amazing thing."

—Changsoo Kang, Ph.D.

This was where Dr. Kang and Dr. Drayna began. They recruited more Pakistani families, plus additional unrelated individuals with stuttering in Great Britain and the United States, and gathered DNA from them and from a group of controls in the same populations. The controls were people who had no history of stuttering in their family. Back at the lab, Dr. Kang began sequencing. It turned out that the region of interest on chromosome 12 contained 87 genes, which meant 87 genes had to be sequenced and analyzed to see if anything interesting turned up.

Forty-five genes and three years later, Dr. Kang felt as if he was working on a project that was going nowhere. "I was tired and frustrated and wanted to give up and go back to Korea," he said. "So I went to Dennis's office and told him how I felt."

From the beginning, Dr. Drayna had known that this was a high-risk, high-reward project and there was a possibility that the dice wouldn't roll in their favor. He couldn't blame Dr. Kang for wanting to give up. He had nothing to show for three years of hard work. The advancement of his career was on the line.

"For the next week, I didn't do any experiments," says Dr. Kang. "I sat at my desk. And then one day, I picked up my lab notebook and started to look through it because I was going to have to hand it over to the new postdoc who would take my place. And I saw something."

What he saw was a mutation in a gene that he'd noticed before, but hadn't thought much of. The gene, *GNPTAB*, was related to a group of diseases known as the mucolipidoses—metabolic disorders that are so lethal, most babies diagnosed with them die in early childhood. He doubted a gene for a metabolic disorder could have anything to do with a speech disorder such as stuttering. Curious, however, he began to look through the scientific literature to find what he could about the mucolipidoses. That was when he came across something intriguing. Children with milder forms of the disorder, who live past infancy, have delayed speech development or speech abnormalities.

Dr. Kang knew he was on to something but he couldn't find any papers in the scientific literature that specifically addressed speech problems in the mucolipidoses. So he did what we all do when we need to know something right away—he Googled. "Mucolipodosis + speech" turned up a site that described a type of mucolipidosis in which children don't speak at all. Not a word. With that, he knew he had to be headed in the right direction.

Further sequencing of the DNA from the Pakistani families showed that the mutation was present in some people who stuttered. Sequencing also revealed that the same mutation was found in members of the original linkage study group. Since the *GNPTAB* gene was known to work with two other genes—*GNPTG* and *NAGPA*—he sequenced them and found mutations that were present in stutterers and their families, but not in the control groups. In fact, no one had ever found a human with any disease associated with mutations in *NAGPA*, until now. Its only known effect is stuttering.

"This project serves as a 'poster child' for the intramural program of the NIH," says Dr. Drayna. "It's taken us more than a decade to get this first major result, and Dr. Kang's Herculean efforts eventually paid off, but it took quite a bit of time. It's a tremendous privilege to serve in an institution that allows long-term, high-risk research."

As Dr. Kang thinks back on his days as an undergraduate, when he was asked about the roles genes play in humans, he can't help but laugh at the irony. "My instructor said that genes had nothing to do with speech. But it turned out that they did, and I discovered one of them. It's an amazing thing."

Read the press release on the NIDCD Web site at **http://www.nidcd.nih.gov/news/releases/10/02_10_10.htm**, or read the abstract at **http://www.pubmed.gov** and search for PMID: 20147709.

Inside NIDCD Newsletter

National Institute on Deafness and Other Communication Disorders
National Institutes of Health

www.nidcd.nih.gov

Spring 2010

Recent Research and News

A New Mission for the Nose: Sniffing Out Multiplying Microbes

In new research published in the Proceedings of the National Academy of Sciences, NIDCD-funded scientist Thomas Finger, Ph.D., and his team at the University of Colorado's Rocky Mountain Taste and Smell Center built on earlier mouse studies to find a possible new role for the nose: a first-line defender against disease-causing bacteria. Read more on the NIDCD Web site at **http://www.nidcd.nih.gov/news/releases/10/01_26_10.htm**, or read the abstract at **http://www.pubmed.gov** and search for PMID: 20133764.

Gene Linked to a Rare Form of Progressive Hearing Loss in Males is Identified

A gene associated with a rare form of progressive deafness in males has been identified by an international team of researchers funded by the NIDCD. The gene, PRPS1, appears to be crucial in inner ear development and maintenance. The gene is associated with DFN2, a progressive form of deafness that primarily affects males. The findings are published in the Dec. 17 early online issue of the American Journal of Human Genetics. Read more on the NIDCD Web site at **http://www.nidcd.nih.gov/news/releases/09/12_17_09.htm**, or read the abstract at **http://www.pubmed.gov** and search for PMID: 20021999.

Dr. Mabel Rice reading with a young friend.
Credit: Steve Puppe

Gene Discovered in Childhood Language Disorder Provides Insight into Reading Disorders

The recent discovery of a gene associated with specific language impairment (SLI), a disorder that delays first words in children and slows their mastery of language skills throughout their school years, offers new insight into how our genes affect language development. The gene, KIAA0319, appears to play a key role in SLI, but it also plays a supporting role in other learning disabilities such as dyslexia. The finding, published in the Journal of Neurodevelopmental Disorders, is the result of a collaborative team effort headed by Mabel Rice, Ph.D., a University of Kansas professor and NIDCD-funded scientist. Read more at the NIDCD Web site on **http://www.nidcd.nih.gov/news/releases/09/12_11_09.htm**, or read the abstract at **http://www.pubmed.gov** and search for PMID: 19997522.

What a Mouse with 'Golden Ears' can Tell Us About Older Brains

In recent research published in the Neurobiology of Aging, NIDCD-supported scientists have created a mouse model that is comparable to an older adult who has the ears of a healthy 20-year-old but the brain of that 20-year-old's great-grandmother. They created the model when they crossed two mouse strains commonly used to study age-related hearing loss. Using technologies that are commonly used to screen newborns for hearing loss, the researchers found that the offspring of this cross had significantly better hearing than either of the parents, but their brains had difficulty compensating for sound in background noise. Read more on the NIDCD Web site at **http://www.nidcd.nih.gov/news/releases/09/11_18_09.htm**, or read the abstract at **http://www.pubmed.gov** and search for PMID: 19879021.

Words, Gestures Are Translated by Same Brain Regions, Says New Research: Findings May Further Our Understanding of How Language Evolved

In a study published in the Proceedings of the National Academy of Sciences, NIDCD researchers in collaboration with scientists from Hofstra University School of Medicine, Hempstead, N.Y., and San Diego State University have shown that

(continued on page 4)

the brain regions that have long been recognized as a center in which spoken or written words are decoded are also important in interpreting wordless gestures. These regions include the inferior frontal gyrus, or Broca's area, in the front left side of the brain, and the posterior temporal region, commonly referred to as Wernicke's area, toward the back left side of the brain. The findings suggest that these brain regions may play a much broader role in the interpretation of symbols than researchers have thought and, for this reason, could be the evolutionary starting point from which language originated. Read more on the NIDCD Web site at **http://www.nidcd.nih.gov/news/releases/09/11_09_09.htm**, or read the abstract at **http://www.pubmed.gov** and search for PMID: 19923436.

NIDCD Highlights

Noisy Planet Campaign Receives NHCA Media Award

NIDCD's *It's a Noisy Planet. Protect Their Hearing* campaign recently received the Media Award from the National Hearing Conservation Association (NHCA). Since 1993, the NHCA Media Award has recognized the efforts of writers or producers of news features that serve to heighten public awareness of the hazards of noise. It is also available to NHCA members who take the time and effort to bring hearing conservation–related issues into public light.

The award was presented on Saturday, February 27, at the NHCA's 35th Annual Hearing Conservation Conference in Orlando, Fla.

For more information about NHCA awards and their recent conference, visit their Web page at **http://nhca.affiniscape.com/displaycommon.cfm?an=7**. To learn about the Noisy Planet campaign, go to **http://www.noisyplanet.nidcd.nih.gov**.

NIDCD Director Receives 2009 Kerry-Manheimer Award

NIDCD Director James F. Battey, Jr., M.D., Ph.D., received the 2009 Kerry-Manheimer Award given by the Monell Chemical Senses Center in Philadelphia.

Established in 1976, the Kerry-Manheimer Award recognizes the career contributions of outstanding researchers in the chemosensory sciences. The honoree is selected by the Monell Center's faculty.

Dr. Battey, who is also vice-chair of the NIH Stem Cell Task Force, received the award on October 14 when he delivered a lecture to Monell's scientists on "NIH Guidelines for Human Stem Cell Research." The lecture focused on the Presidential Executive Order to remove barriers to responsible research involving human stem cells.

To learn more about the Kerry-Manheimer Award, go to **http://www.monell.org/news/of_note/battey_award**, or the NIDCD Web site at **http://www.nidcd.nih.gov/news/releases/09/10_22_09.htm**.

Monell Director Dr. Gary K. Beauchamp (l) and NIDCD Director Dr. James F. Battey, Jr., with his award.
Credit: Monell Center

Inside NIDCD Newsletter

National Institute on Deafness and Other Communication Disorders
National Institutes of Health

www.nidcd.nih.gov

Spring 2010

Grants News

ARRA Summer Internships Introduce a New Generation to NIDCD-Funded Research

As part of the 2009 American Recovery and Reinvestment Act (ARRA), NIDCD received about $100 million to fund top-notch science in pursuit of improving the quality of American lives, while at the same time stimulating the economy.

One of our investments under the Recovery Act brought new energy to laboratories across the country, as NIDCD-funded researchers provided summer research experiences for students, science teachers, and faculty from non-research-intensive institutions. To learn how the interns—some of them scientists in the making—and their mentors both benefited from the experience, visit the NIDCD's Web site at **http://www.nidcd.nih.gov/funding/ARRA/ResearchInternships.htm**.

Meetings of Interest

American Academy of Audiology (AAA)
AudiologyNOW! 2010
April 14-17
San Diego, Calif.

AAA expects nearly 7,000 audiologists, students, otolaryngologists, and vendors at this gathering to learn about cutting-edge audiological research. This year's program also includes the Academy Research Conference, and research and clinical posters in the exhibit area. Go to their Web site at **http://www.audiologynow.org**.

Hearing Loss Association of America (HLAA)
HLAA Convention 2010
June 17-20
Milwaukee, Wis.

HLAA presents its national educational program and trade show including special workshops for parents and educators, and a research symposium on *Hearing Aid Research and Development: What It Means for the Consumer*. Go to their Web site at **http://www.hearingloss.org/convention**.

Alexander Graham Bell Association for the Deaf and Hard of Hearing (AG Bell)
AG Bell 2010 Biennial Convention
June 25-28
Orlando, Fla.

AG Bell's 2010 Biennial Convention offers something for everyone, including: 11 intensive short courses; 80 concurrent sessions for families, individuals with hearing loss, and professionals; 3 "super sessions" in parent advocacy, career transitions, and hearing loss; programming for children and teens; more than 60 exhibitors; and continuing education credits through the AG Bell Academy, the American Speech-Language-Hearing Association (ASHA), and the American Academy of Audiology (AAA). Go to their Web site at **http://nc.agbell.org/NetCommunity/Page.aspx?pid=323**.

National Association of School Nurses (NASN)
NASN 42nd Annual Conference
June 29-July 3
Chicago, Ill.

With the theme *Vision, Voice, Visibility: Charting the Course for a Healthy Future*, this year's NASN's conference goals for school nurses are to summarize the current research and evidence for school nursing practice; describe ongoing efforts to promote health and prevent disease or disability in the school community; suggest achievable partnerships to support healthy policies and programs; and expand members' professional network. Go to their Web site at **http://www.nasn.org/Default.aspx?tabid=109**.

National Stuttering Association (NSA)
26th Annual Conference and Research Symposium
July 7-11
Cleveland, Ohio

NSA's annual conference and research symposium offers adults and children who stutter, their families, and speech-language professionals interactive workshops, motivational speakers, and opportunities to network. Go to their Web page for more information at **http://www.nsastutter.org/connect/conferences.html**.

Inside NIDCD Newsletter

National Institute on Deafness and Other Communication Disorders
National Institutes of Health

www.nidcd.nih.gov

Spring 2010

Beyond NIDCD: News from Other Organizations

Educational Opportunity for Early Hearing Detection and Intervention Service Providers

First Years, a distance-learning program administered by the University of North Carolina at Chapel Hill, offers a certificate in auditory learning for young children with hearing loss. This new program is committed to enhancing the knowledge and skills of professionals practicing in deaf education, speech-language pathology, audiology, and early intervention. The program is now accepting applications (with a May 14 deadline) for a new class beginning this fall. For detailed information about the program, visit their Web site at **http://www.firstyears.org**, or contact Kathryn Wilson, program director, at kathryn_wilson@med.unc.edu.

The Childhood Apraxia of Speech Association of North America (CASANA) Sponsors Two Workshops

Apraxia-KIDS
Every Child Deserves a Voice

This spring, CASANA is sponsoring two hands-on workshops. Participants will learn the most recent information on childhood apraxia of speech (CAS), and will develop a CAS assessment protocol. Videotaped examples of children in treatment will be used to highlight therapy ideas and suggestions for carryover outside of the treatment setting. The workshops are: *Childhood Apraxia of Speech: Assessment and Intervention* on April 16 at Villanova University in Villanova, Pa.; and *Childhood Apraxia of Speech: New Perspectives for Assessment and Treatment* on April 30 at the Colorado Christian University in Denver, Colo.

For more information, contact Kathy Bauer, education director, at kathyb@apraxia-kids.org or call at (412) 343-7102.

NIOSH and NHCA Present 2010 Safe-in-Sound Awards

SAFE·IN·SOUND
Excellence In Hearing Loss Prevention Award

The National Institute for Occupational Safety and Health (NIOSH), in partnership with the National Hearing Conservation Association (NHCA), announced the recipients of the 2010 Safe-in-Sound Excellence in Hearing Loss Prevention Awards at the 35th Annual Hearing Conservation Conference in Orlando, Fla.

The award honors hearing loss prevention programs in the construction, manufacturing, and service sectors. It also recognizes individuals or organizations for innovation in hearing loss prevention and dedication to fostering and implementing new and unique advances in the prevention of hearing loss. This year's awardees were: Etymotic Research, Inc.; the New York City Department of Environmental Protection and Parsons Brinckerhoff, Inc. (PB); and Dr. Kris Chesky and the College of Music, University of North Texas. For further information visit Safe-in-Sound on the Web at **http://www.safeinsound.us**.

New Resources from the National Consortium on Deaf-Blindness (NCDB)

NCDB offers new products free of charge on the Web, including:

Assessing Communication and Learning in Young Children Who Are Deafblind or Who Have Multiple Disabilities, by Charity Rowland, Ed. Find it at **http://www.ohsu.edu/oidd/d2l/com_pro/db_assess_ab.cfm**.

Practice Perspectives: Teaching Prelinguistic Communication. Find it on the Web in English and Spanish at **http://www.nationaldb.org/NCDBProducts.php?prodID=111**.

Deaf-Blind Perspectives, Volume 17, Issue 1, by NCBD. Features articles about interveners (paraprofessionals for children who are deaf-blind), social networking sites for youth who are deaf-blind, and a group of young adults with deaf-blindness who visited the White House and met President Obama. Find it on the Web at **http://tr.wou.edu/tr/dbp**.

For print copies, call (800) 438-9376 or (800) 854-7013 (TTY), or e-mail info@nationaldb.org.

Inside NIDCD Newsletter

National Institute on Deafness and Other Communication Disorders
National Institutes of Health

www.nidcd.nih.gov

Spring 2010

New Resources

New 2010-2011 NIDCD Resources Directory Available Now

The most recent version of the *NIDCD Resources Directory* is a vital reference for health professionals, patients, and their families. It includes details about nearly 150 national organizations that provide information, services, or advocacy on the communication disorders of hearing, balance, smell, taste, voice, speech, and language.

The directory is free of charge. You can order a copy by calling the NIDCD Information Clearinghouse at (800) 241-1044 or TTY at (800) 241-1055, or sending an e-mail to nidcdinfo@nidcd.nih.gov.

NIDCD's Updated Strategic Research Plan on Health Disparities Now Available Online

NIDCD's strategic research plan and budget addressing health disparities for Fiscal Years 2009-2013 is now posted online. The plan is developed at the request of the NIH Director and is updated every three years. Within the plan, NIDCD details steps it is taking to determine how communication disorders may impact health disparities; facilitate participation of special populations in research and research training and ensure that all populations are served in human communication research; and address research opportunities to understand the basis for health disparities within the purview of NIDCD.

Read the health disparities plan on the NIDCD Web site at **http://www.nidcd.nih.gov/about/plans/strategic/FY2009-13-HDplan.htm**.

Inside is produced by the NIDCD Office of Health Communication and Public Liaison. The text in this newsletter is not copyrighted, and we encourage its use. For more information about this newsletter, please contact the editor, Robert Miranda-Acevedo, at **miranda1@mail.nih.gov**. For general health information about communication disorders, contact the NIDCD Information Clearinghouse at:
Voice: (800) 241–1044
TTY: (800) 241–1055
E-mail: nidcdinfo@nidcd.nih.gov

U.S. Department of Health and Human Services
National Institutes of Health
NIH Publication No. 10–4202